Winter
2003-2004
Naval Atlantic Meteorology & Oceanography Center
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04 November 2003
Smithsonian, 1997

Plan of Action

A. Introduction

B. Winter Weather Overvie

C. Platform Impacts

D. Personnel Impacts

E. Available Support

SEVERE WEATHER....

As the aircraft carrier Carl V sails in 12-foot swells in the a sailor is lost overboard. *New York Times*

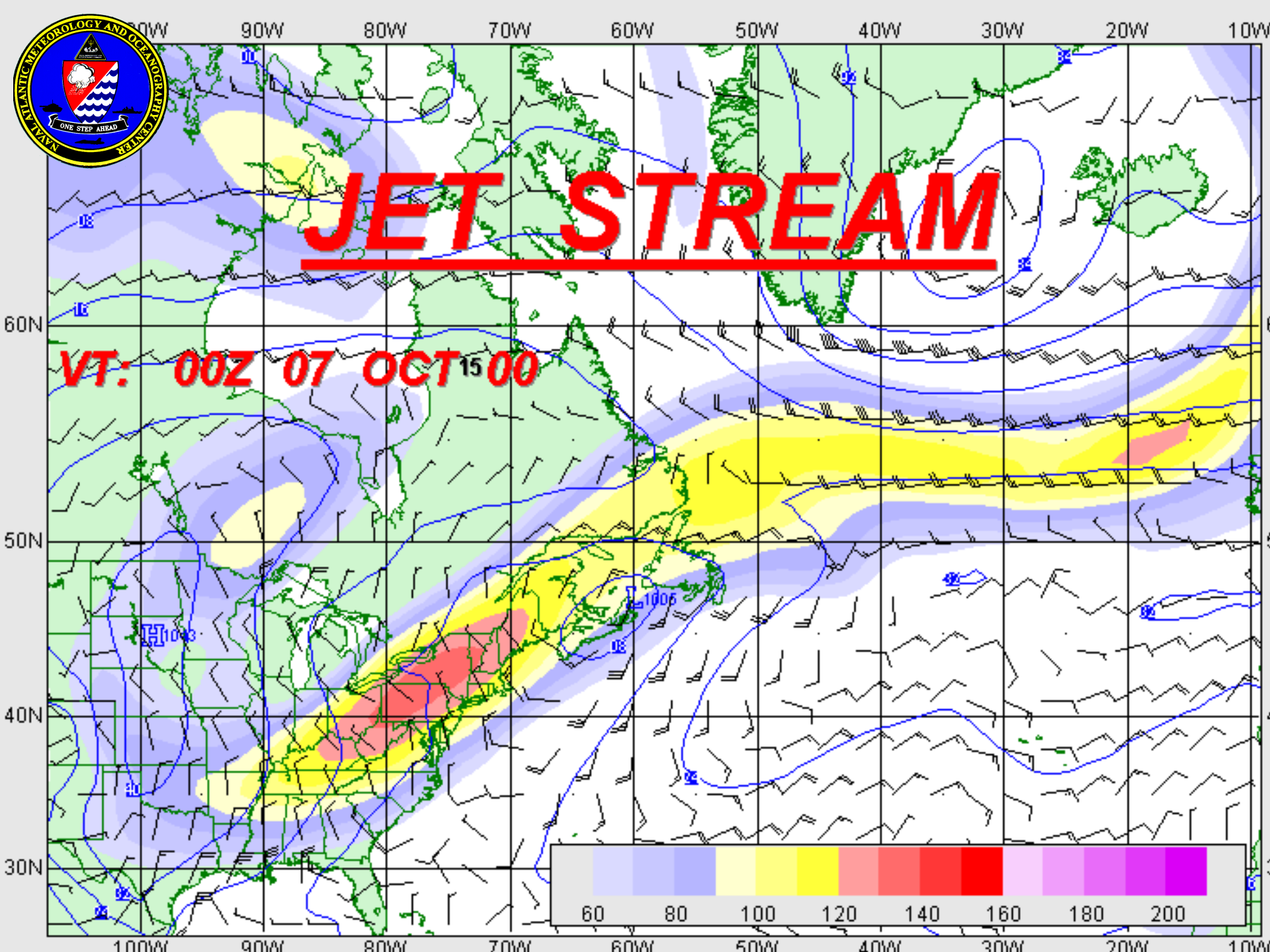
CG North Sea "...16-20 ft following seas and winds i of 60 kts. A wave broke over fantail... breaking antennae located at starboa deck edge..." Cost: $20,500 - *Safety Center Repor*

Oct.31 Wave sweeps over deck of aircraft carrier Dwight D. Eisenhower 90 miles southeast of Cape Hatteras, N.C. Three sailors are washed overboard; two are rescued. More than three dozen missiles are lost. - *New York Times*

"....It was the greatest loss that we have taken without compensato return.... CO's failed to realize sufficiently in advance of the fact th it was necessary to give up the attack and give their attention to sa the ship" - *Nimitz letter of 13 February, 1945*

Winter Weather Overview

1. General Weather Patt
2. Role of Jet Stream.
3. Synoptic Weather Fea
4. Meteorological Bomb
5. The Famous “North W


JET STREAM
VT: 00Z 07 OCT 15 00
90W
80W
70W
60W
50W
40W
30W
20W
60N
50N
40N
30N
60
80
100
120
140
160
180
200

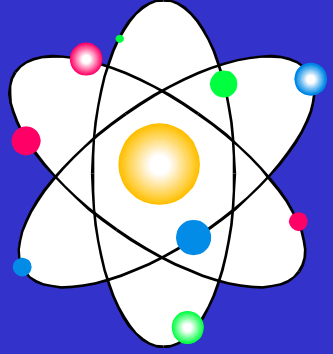
NAVAL ATLANTIC METEOROLOGY AND OCEANOGRAPHY CENTER
ONE STEP AHEAD
Winter Fury!

The Weather... "Bomb"!

Explosive Cyclogenesis

The Bomb!

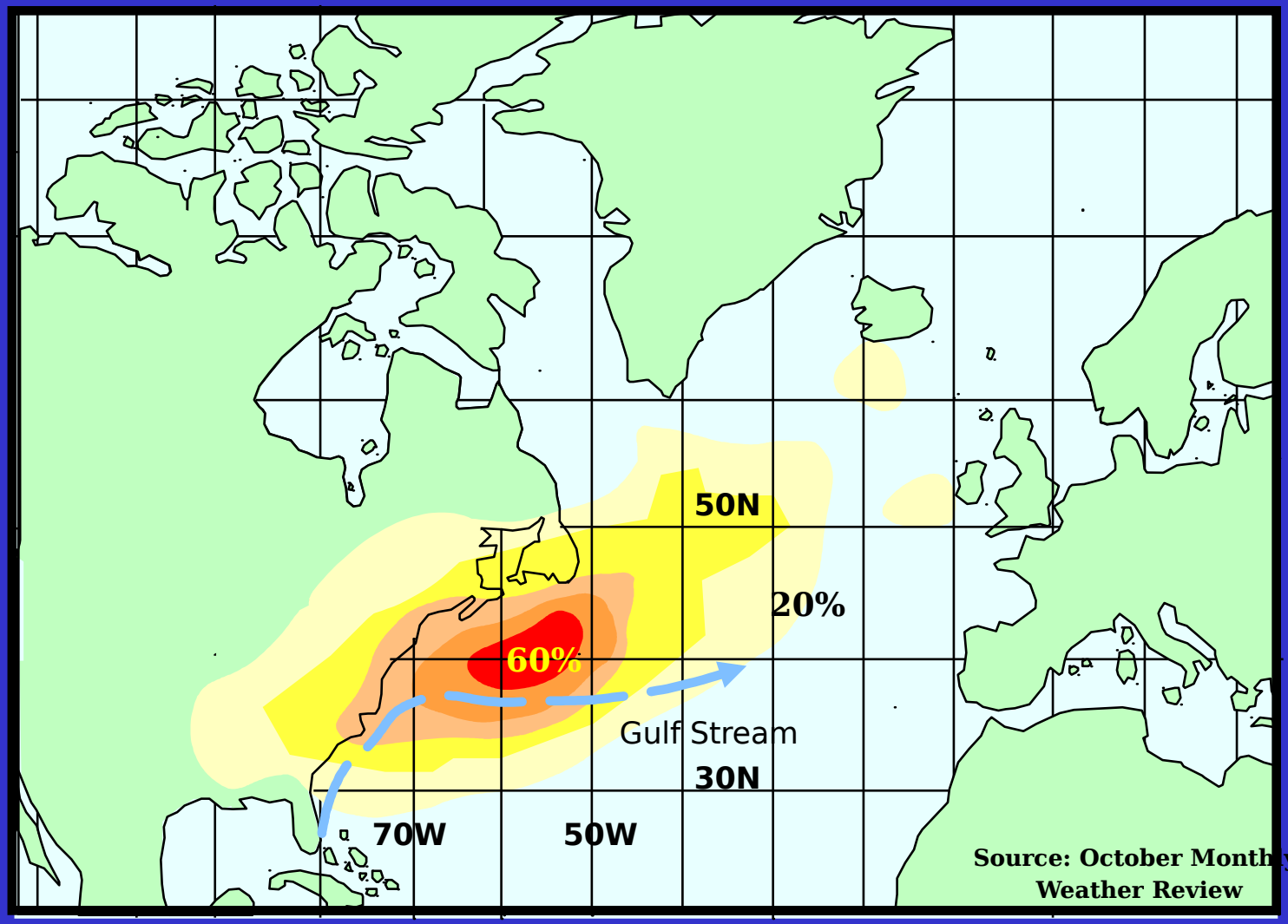
EXPLOSIVE CYCLOGENESIS



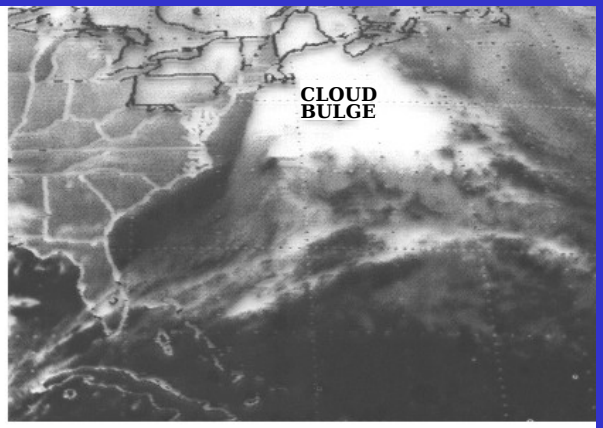
- **Extra-tropical low undergoes extreme rapid development and intensification**
- **Meteorological "Bomb" - 24mb deepening/24hrs (Bergeron)**
  - Weak: 1.0 Bergeron
  - Moderate Bomb: 1.3-1.8 Bergeron
  - Strong Bomb: >1.8 Bergeron
- **In Study (Sept 76-May 79), greatest deepening was 3.4 Bergeron (81.6mb/24hr)**
- **Although Pacific bomb frequency was 1.5 that of the Atlantic, Atlantic had twice as many extreme events (2 Bergeron)**

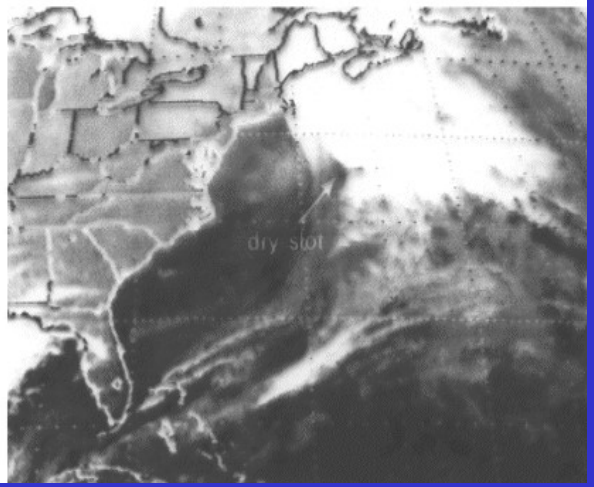
Source: Monthly Weather Review article "Synoptic-Dynamic Climatology of the Bomb"

FREQUENCY OF EXPLOSIVE CYCLOGENESIS IN THE NORTH ATLANTIC



EXPLOSIVE CYCLOGENESIS (1)





1000 mb or more

The low center is not well defined by the cloud pattern.

The multi-layered cloud band shows a slight brightening and anticyclonic bending

Central pressure: 1011 mb 0000Z 22 November

990 - 999 mb

A dry slot of clear air forms on the rear edge of t
pattern. The system should be watched closely f
possible deepening.

Central pressure: 996 mb 0600Z 22 Novemb

EXPLOSIVE CYCLOGENESIS (2)

980 - 989 mb

The cloud band develops a distinct hook to the
and west of the surface low. By 980 mb, the cl
band wraps around the low 1/2 to 3/4 times.

Central pressure: 981 mb 1200Z 22 Novem

970 - 979 mb

The cloud band wraps around the low center a
one full time.

Central pressure: 974 mb 1800Z 22 Novem

EXPLOSIVE CYCLOGENESIS (3)

Below 969 mb

The cloud band wraps around the low center
times with low and mid clouds sometimes filli
between the encircling cloud band. The circu
center is concentrically located within the sp
formed by the clouds.

Central pressure: 966 mb 0000Z 23 Nove

Mature stage

The spiral bands have become fragmented, w
cloud-free areas appearing between the band
surface pressure can no longer be accurately
estimated from the cloud pattern.

Central pressure: unk 0600Z 23 Nover

The North Wall....

Source: “The Perfect Sto

NAVY SAFETY CENTER REPORTS

LST Transiting North Wall
-16-20 ft seas
-Violent pitch and roll
-Boat boom lost: $20,000

DD Transiting North Wal
-18-20 ft seas
-40-50 kt wind
-Life raft lost: $4000
-Weather prediction susp

AOR Transiting the North W
-25-30 ft seas
-Waves breaking over deck
-40ft UB skid collapsed
-40ft UB keel broken
Damage: $135,000

North Wall Effect

- High seas over the gulf stream
  - warm ocean current
  - flows north along Southeast U.S. coast at 1.2 to 2.5 kts
- Typically a cold season event
  - high winds
  - cold air
- Two types
  - Perpendicular flow
  - Opposing flow

Perpendicular Flow

- Cold air flows over warm water
  - minimum 20 degrees F temperature difference required
  - common with "cold-air outbreak"
- Resulting convection brings higher speed air from aloft to surface
- Higher surface winds....higher waves
- Worst place is where gulf stream is closest to land....Cape Hatteras
- Effect of seas felt further seaward

PERPENDICULAR WIND FLOW

Air Temp: 45 Deg
SFC Winds: 30 kts
Gulf Stream: 43 kts

Hatteras

North Wall

Gulf Stream

South Wall

Vs - 3

Ts - 75

20 ft

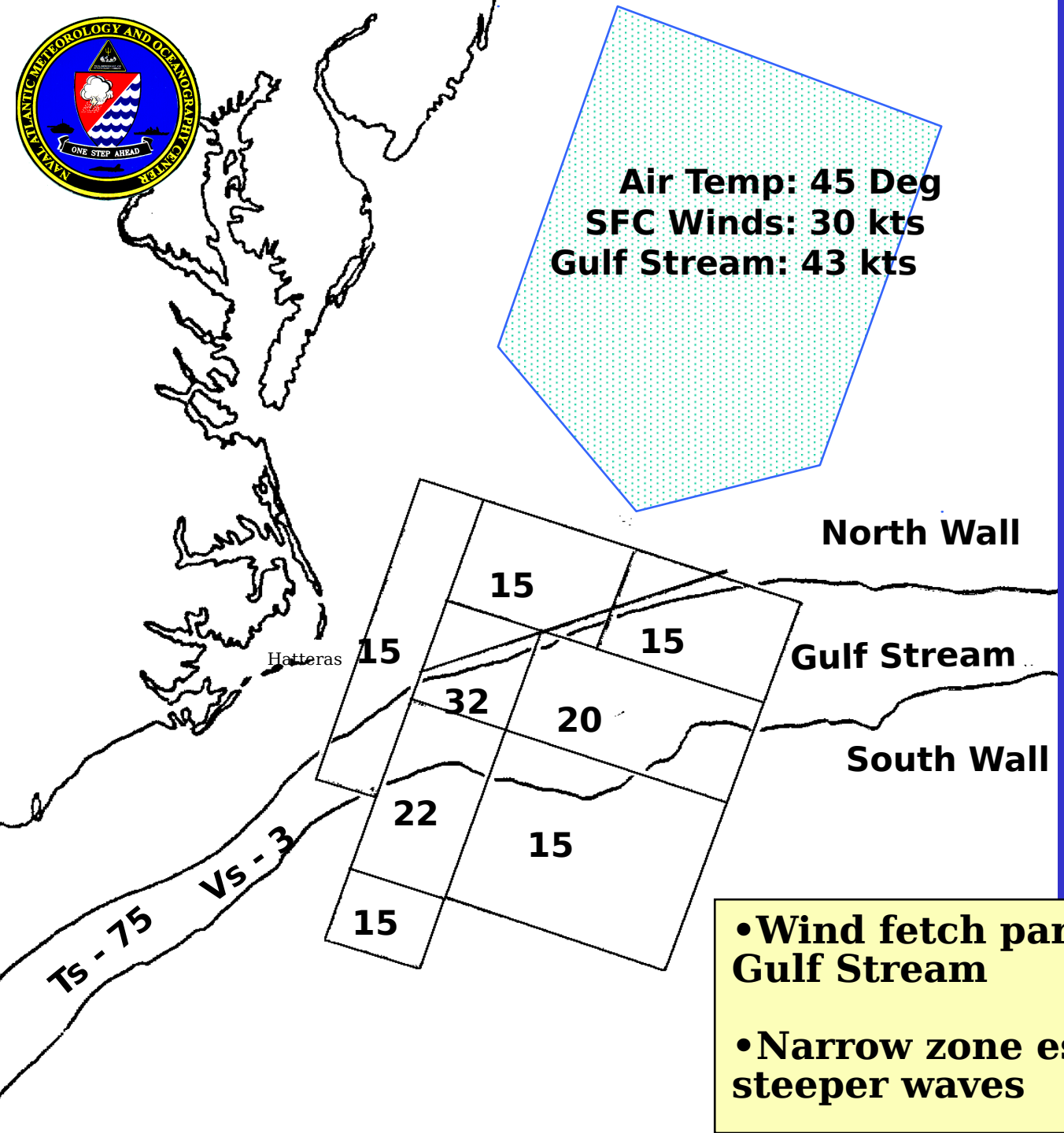
15 ft

- Air is less modified with extreme gustiness
- Effects felt further seaward

Opposing Flow

- NE winds flowing over northeastward flowing current...
- generates very high, steep waves...
- over a fairly narrow zone
- temperature contrast not as important
- typically occurs with stalled front off the Mid-Atlantic coast
- common with Hatteras / VACAPES developing storm

PARALLEL WIND FLOW

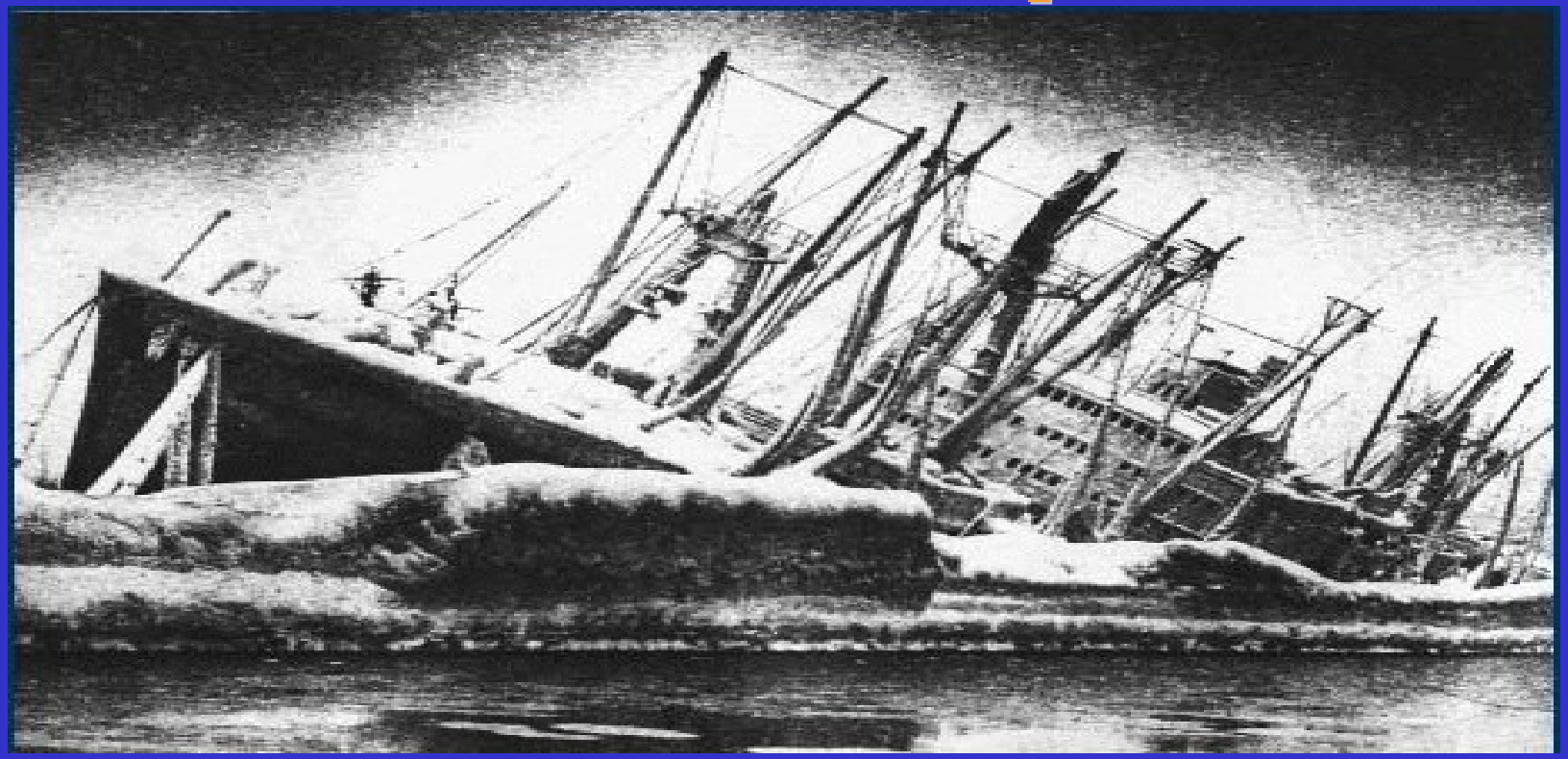


- Wind fetch parallels but opposes Gulf Stream
- Narrow zone established with steeper waves

Warning Message

- Issued by NAVLANTMETOCCEN Optimum Track Ship Routing (OTSR)
- Warning box with highest conditions forecast and effective times
- Also provides gulf stream location by series of lat/long points

Platform Impacts



Ice Accretion

Winds/Seas

Degraded Visibility

Extreme Temperatures

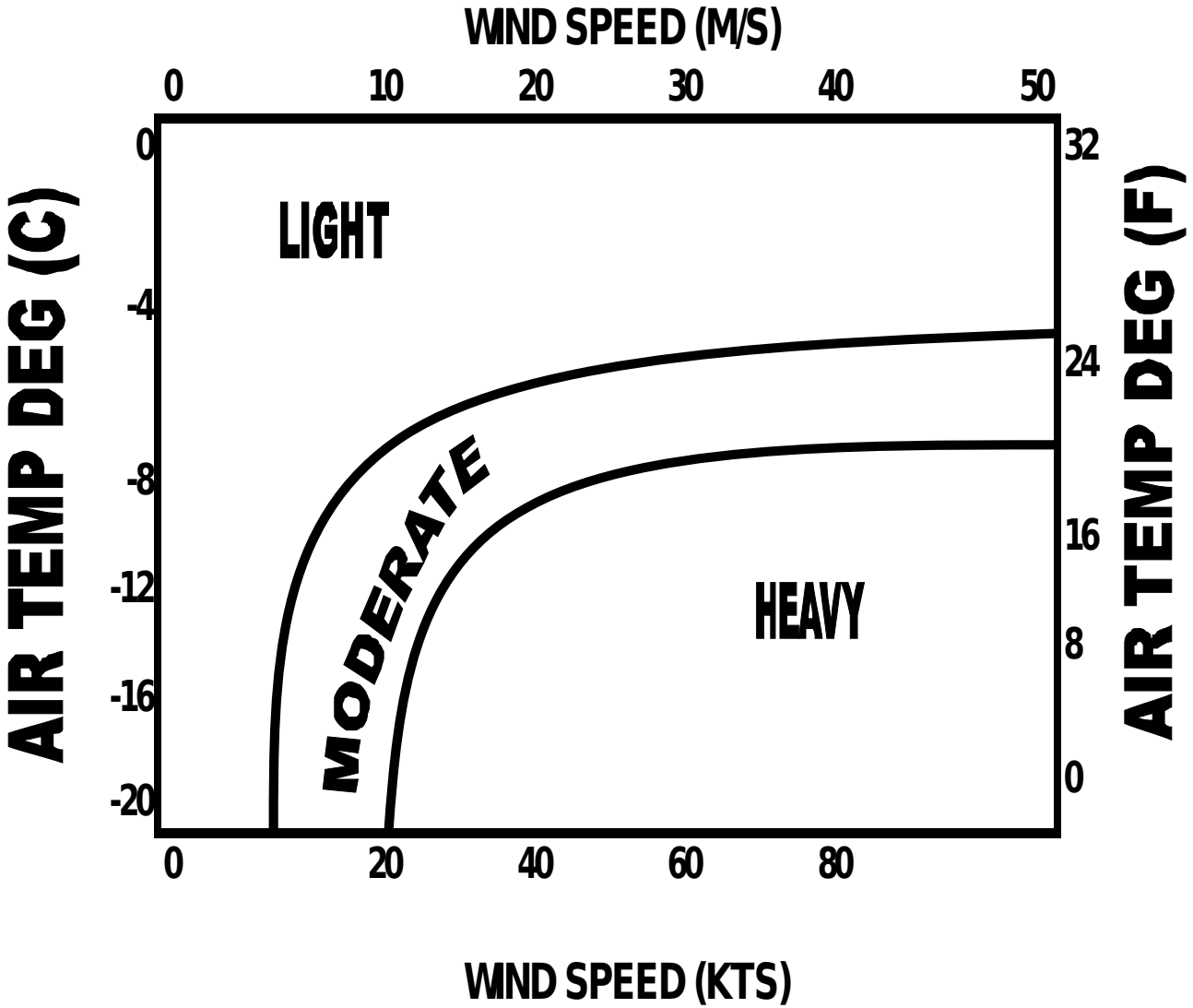
Ice Accretion

Air Temperature

Water Temperatu

Wind Velocity

ICING CONDITIONS FOR VESSELS HEADING INTO OR ABEAM OF THE WIND FOR WATER TEMPERATURES OF +7 DEG C (45 DEG F)

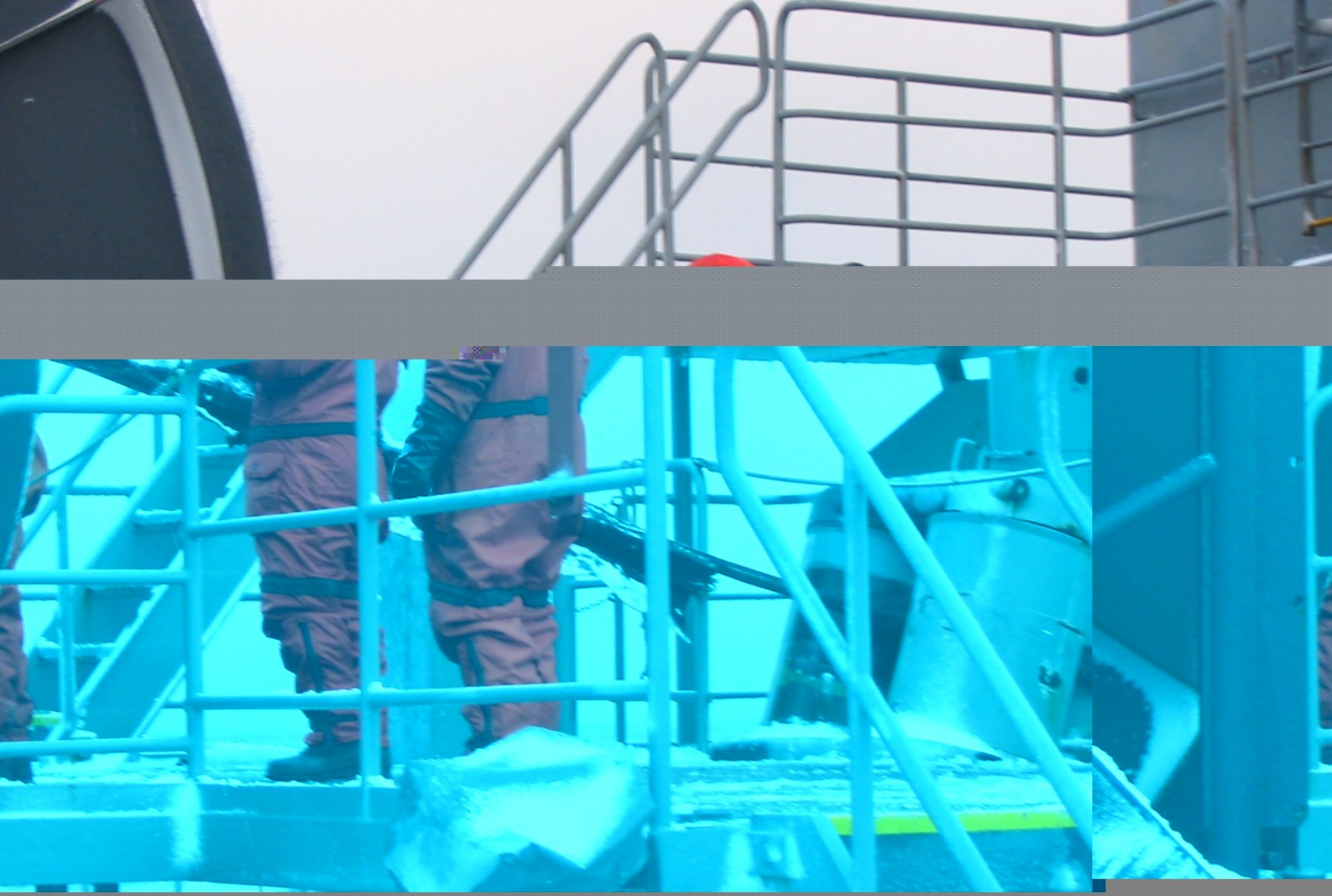


Ice Accretion Impact on Platform

- Stability/ Maneuverabi

- Equipment Effectivenes

-Safety On-Dec

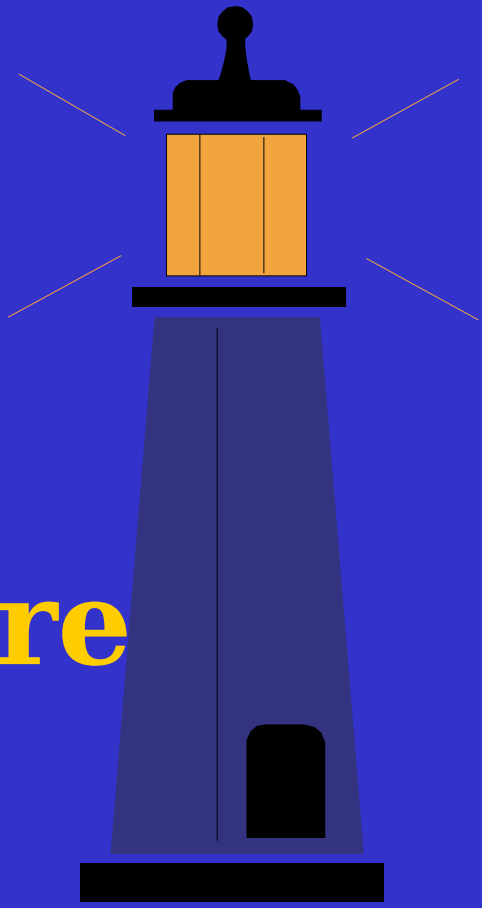


Visibility Degradation

-Blowing Spray

-Fog/Ice Fog

-Vicinity Coastal Are



Wind / Sea Hazards

- Wind Waves Determined b
  - --Wind Velocity
  - --Fetch
  - --Duration

- Swell Waves
- Combined Seas

Heavy Weather

Anticipate Conditions

Keep Sea Legs

Stow Loose Gear

Shipmates Shipshape

Mission Impacts ?

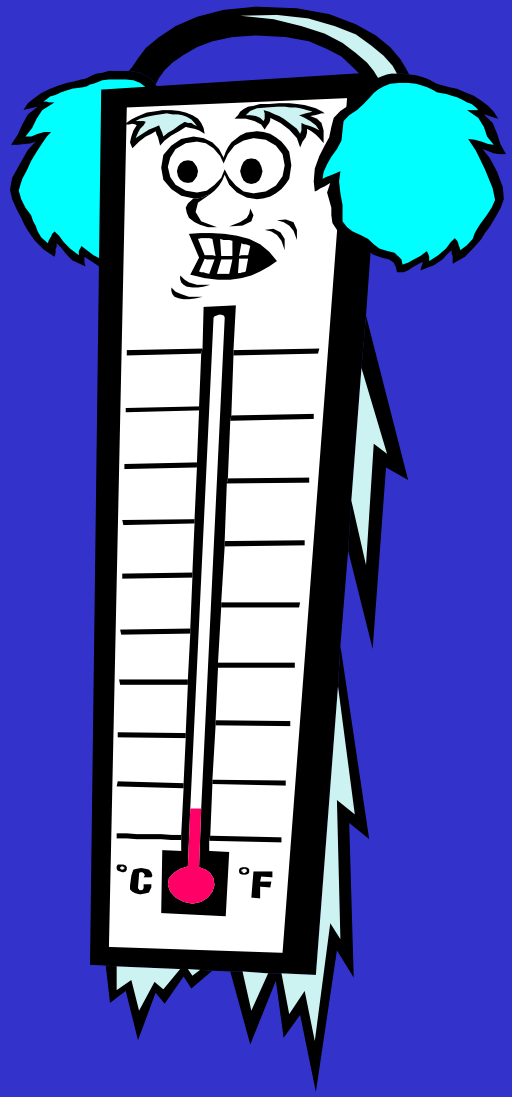
Extreme Temperatures

- Frozen Topside Equipment

- Wind Chill

- *Frostbite*

- *Hypothermia*

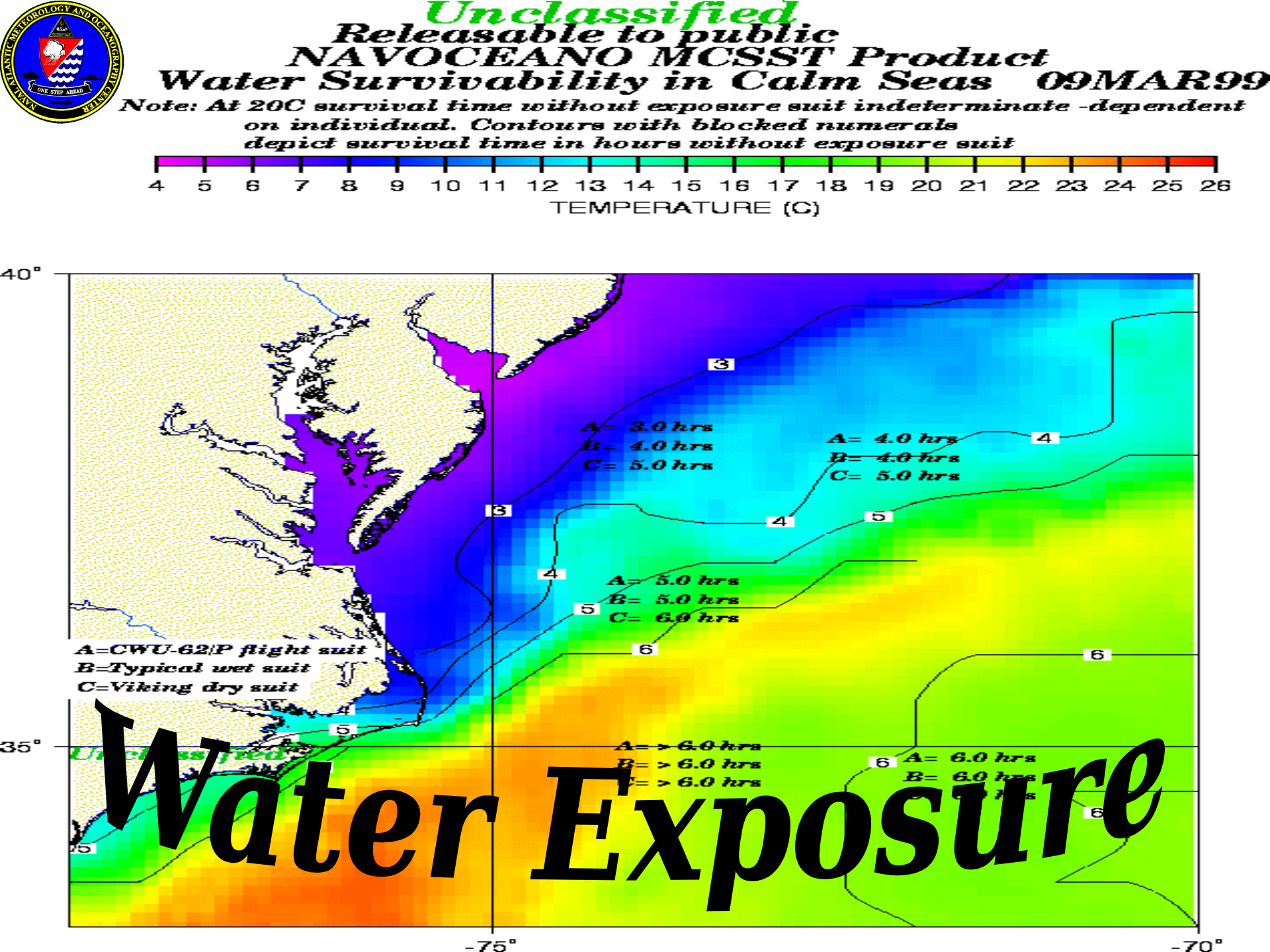


Wind Chill Chart

Temperature (°F)

Wind (mph)	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Calm																		
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite occurs in 15 minutes or less


Unclassified
Releasable to public
NAVOCEANO MCSST Product
Water Survivability in Calm Seas 09MAR99
Note: At 20C survival time without exposure suit indeterminate -dependent on individual. Contours with blocked numerals depict survival time in hours without exposure suit
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
TEMPERATURE (C)
40°
35°
-75°
-70°
A= 3.0 hrs
B= 4.0 hrs
C= 5.0 hrs
A= 4.0 hrs
B= 4.0 hrs
C= 5.0 hrs
A= 5.0 hrs
B= 5.0 hrs
C= 6.0 hrs
A= > 6.0 hrs
B= > 6.0 hrs
C= > 6.0 hrs
A= 6.0 hrs
B= 6.0 hrs
A=CWU-62/P flight suit
B=Typical wet suit
C=Viking dry suit
Water Exposure

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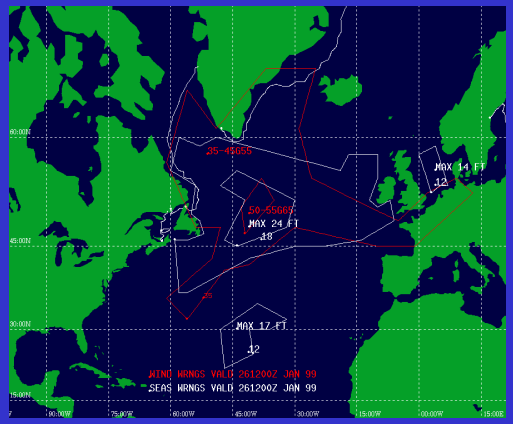
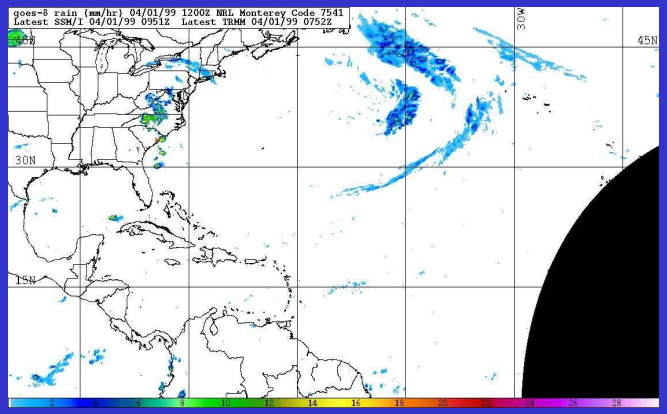
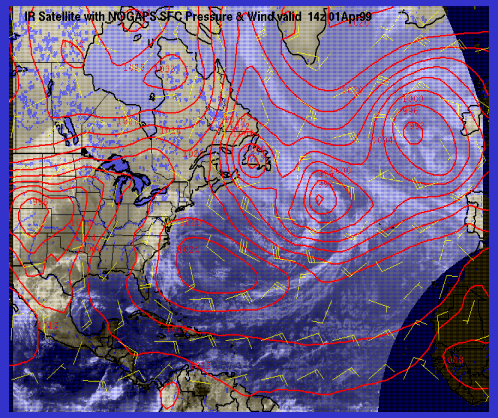
ONE STEP AHEAD
NAVAL ATLANTIC METEOROLOGY AND OCEANOGRAPHY CENTER

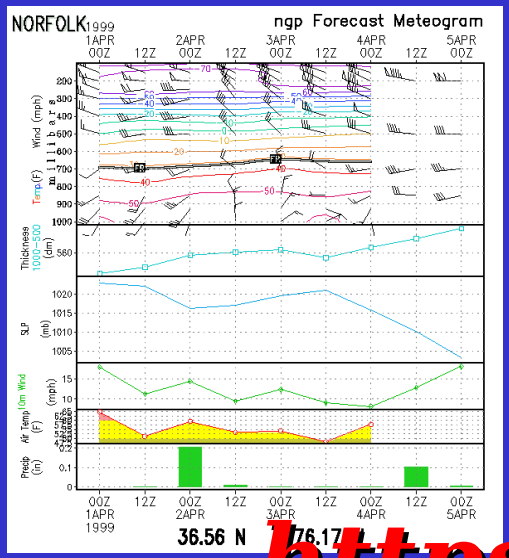
Available Support

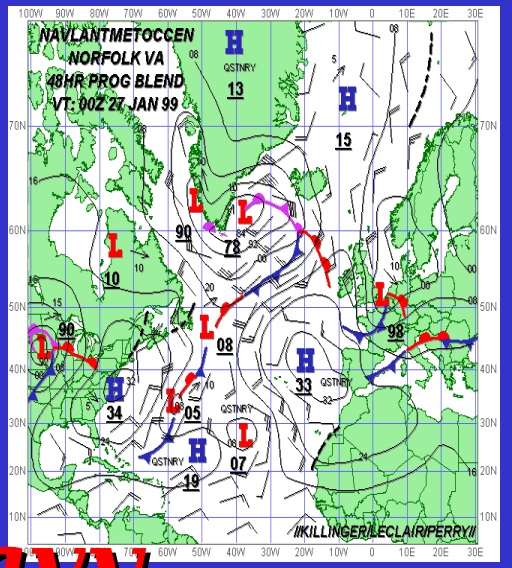
Naval Atlantic Meteorology and Oceanography Center



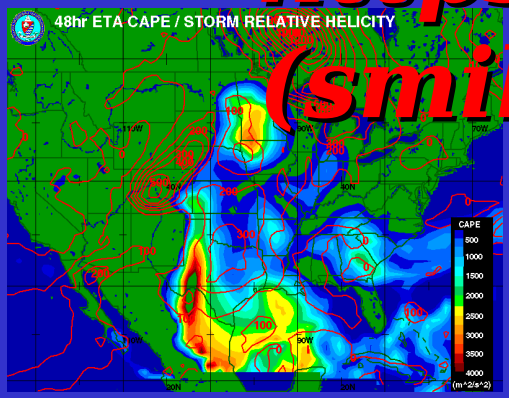






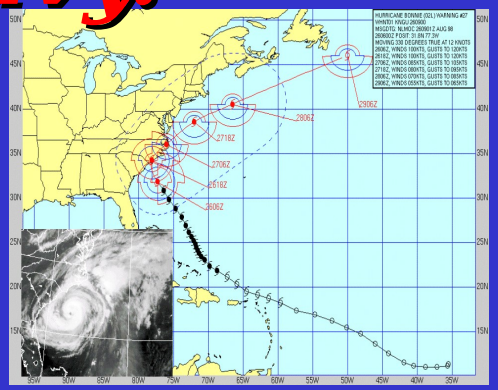


https://www.nlmoc.navy.(smil).mil

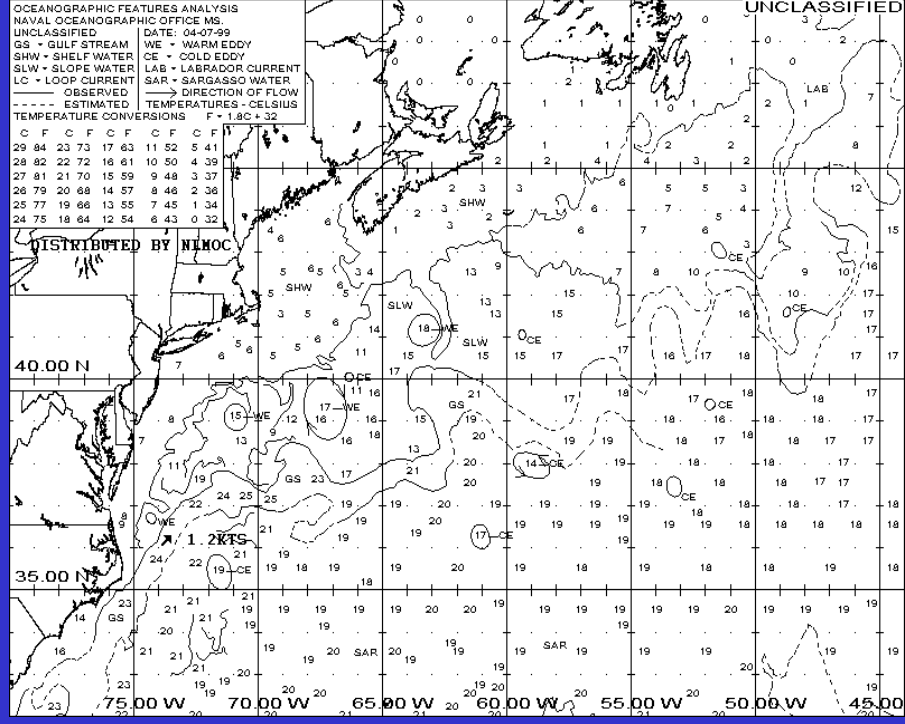


NORFOLK AREA FORECAST 01 FEB - 05 FEB 1999

	MON 01 FEB	TUE 02 FEB	WED 03 FEB	THU 04 FEB	FRI 05 FEB
	am pm	am pm	am pm	am pm	am pm
WIND	E'LY 12-17 INCR5G S'LY 15-20G25 BY LATE EVE.	S'LY 15-20G25 BECMG WNW 8-12 LATE AFTN.	NW 15-20 DECR 8-12 BY EVE	WNW 8-12 INCR 15-20 BY EVE	NW 12-17 DECR LGT/VRBL BY EVE
MAX TEMP	50°F 10°C	58°F 14°C	55°F 12°C	54°F 12°C	55°F 12°C
MIN TEMP	40°F 4°C	48°F 8°C	45°F 7°C	47°F 8°C	38°F 3°C
MIN VIS	1-3	1/2-3	3-5	UNR	UNR



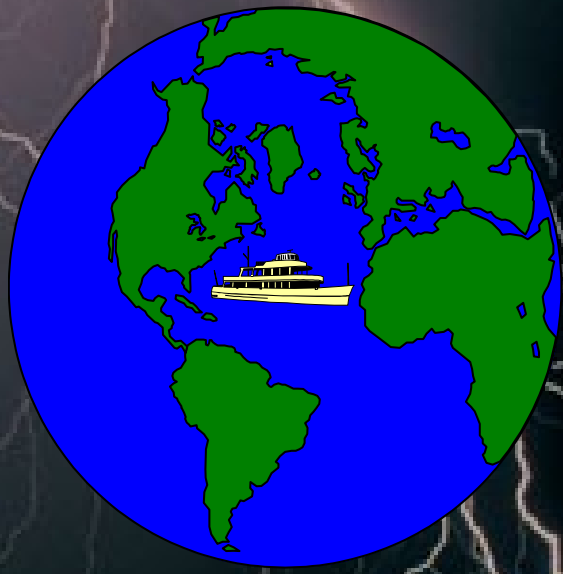
OCEANOGRAPHY SUPPORT



GULF STREAM

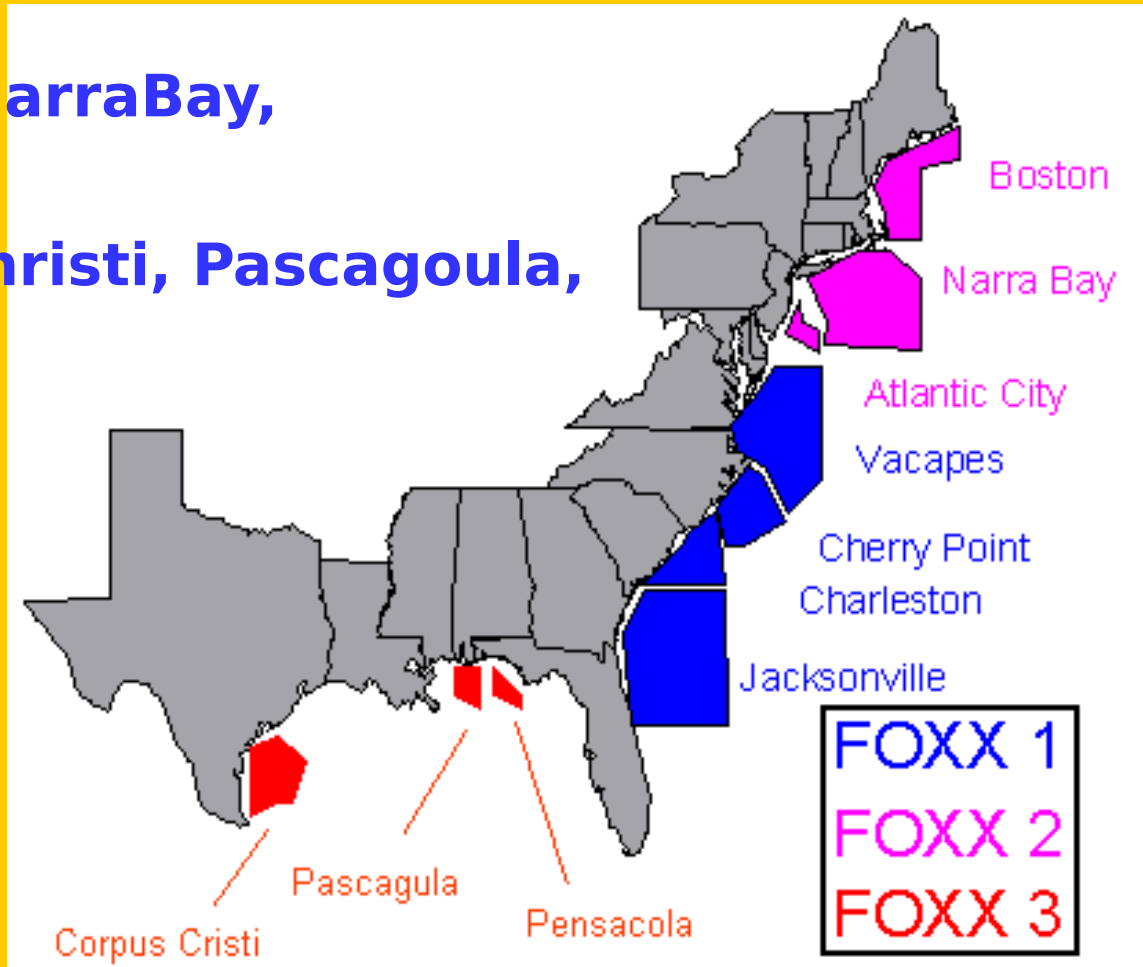
Comprehensive METO Suppor

- ***Deliver METOC products via:***
  - S IPRNET & NIPRNET homepages
  - AUTODIN message
  - GCCS-M overlays
  - SALTS
  - HF fax broadcast
  - Face-to-face briefings
- ***Individual service through OTSR/WEAX***
- ***Dedicated support with embarked MET***
  - Full spectrum METOC support underway
  - Navigation briefs inport
  - Pre-sail graphics inport



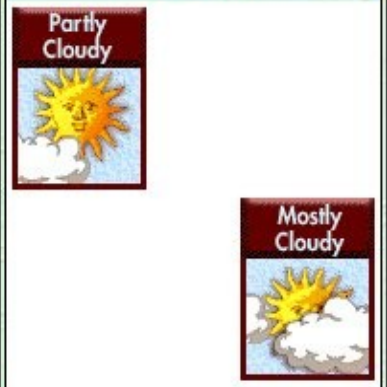
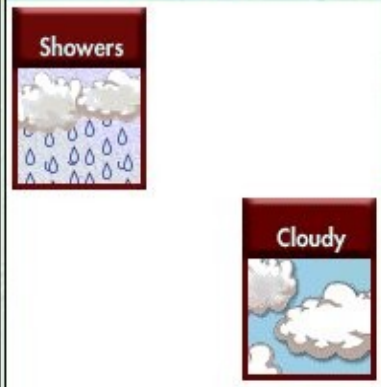
Routine Forecasts

- **Oparea Forecasts**
  - **FOXX01: VACAPES, Cherry Pt., Charleston, Jacksonville**
  - **FOXX02: Boston, NarraBay, Atlantic City**
  - **FOXX03: Corpus Christi, Pascagoula, Pensacola**
- **Local**
  - **Five Day**
  - **Drive Safe**



Norfolk AREA FORECAST 03 NOV - 07 NOV 2003

Forecast Last Modified Mon Nov 3 5:37Z 2003

	MON 03 NOV	TUE 04 NOV	WED 05 NOV	THU 06 NOV	FRI 07 NOV
					
WIND	LGT/VRBL BCMG SE 5-10 LATE MRNG THEN BCMG LGT/VRBL LATE EVNG	LGT/VRBL BCMG SE 5-10 LATE MRNG THEN BCMG S'LY BY SUNRISE	S'LY 5-10 INCRSG SW 8-13 EARLY AFTN	SW 8-13 SHFTG N'LY BY EARLY AFTN THEN INCRSG NE 13-18G23	NE 13-18G23 DCRSG 8-13 EARLY EVNG
MAX TEMP	76°F 24°C	75°F 23°C	76°F 24°C	69°F 20°C	60°F 15°C
MIN TEMP	61°F 16°C	62°F 16°C	62°F 16°C	50°F 10°C	47°F 8°C
MIN VIS	2-4 IN AM FOG	UNR	2-4 IN SHWRS	2-4 IN SHWRS	2-4 IN SHWRS

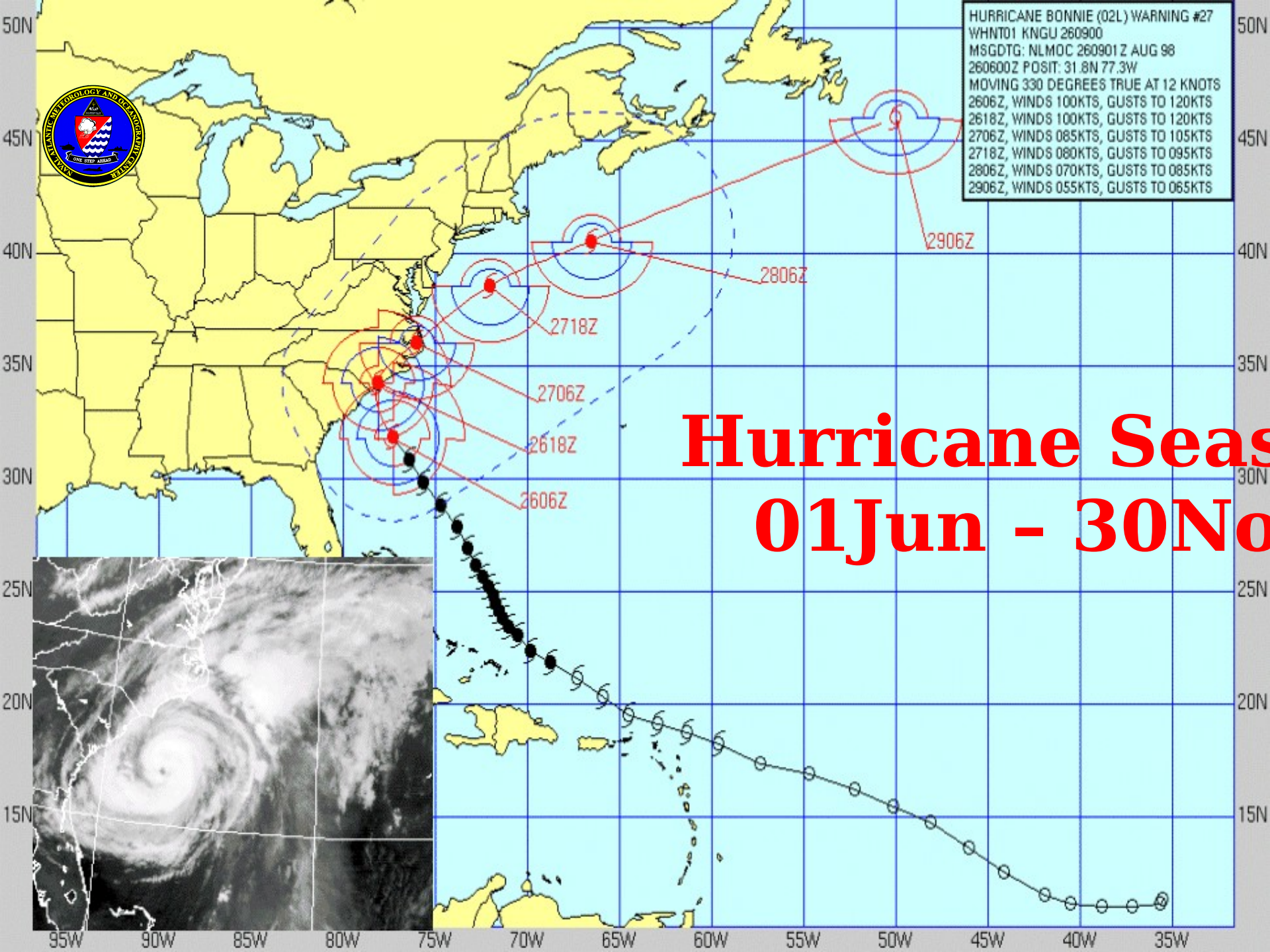
TEMPERATURE SCALE

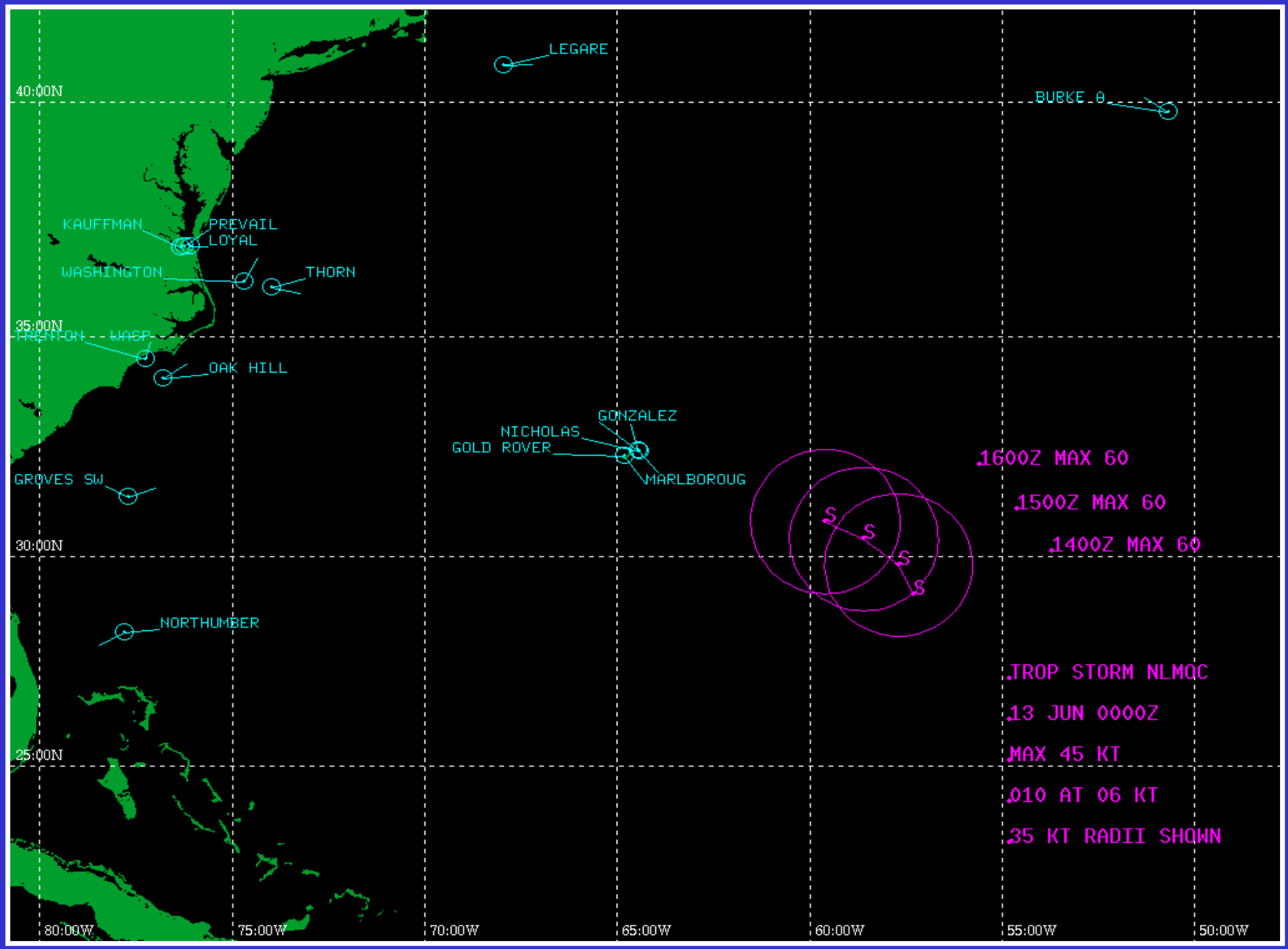
< 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89	90 >

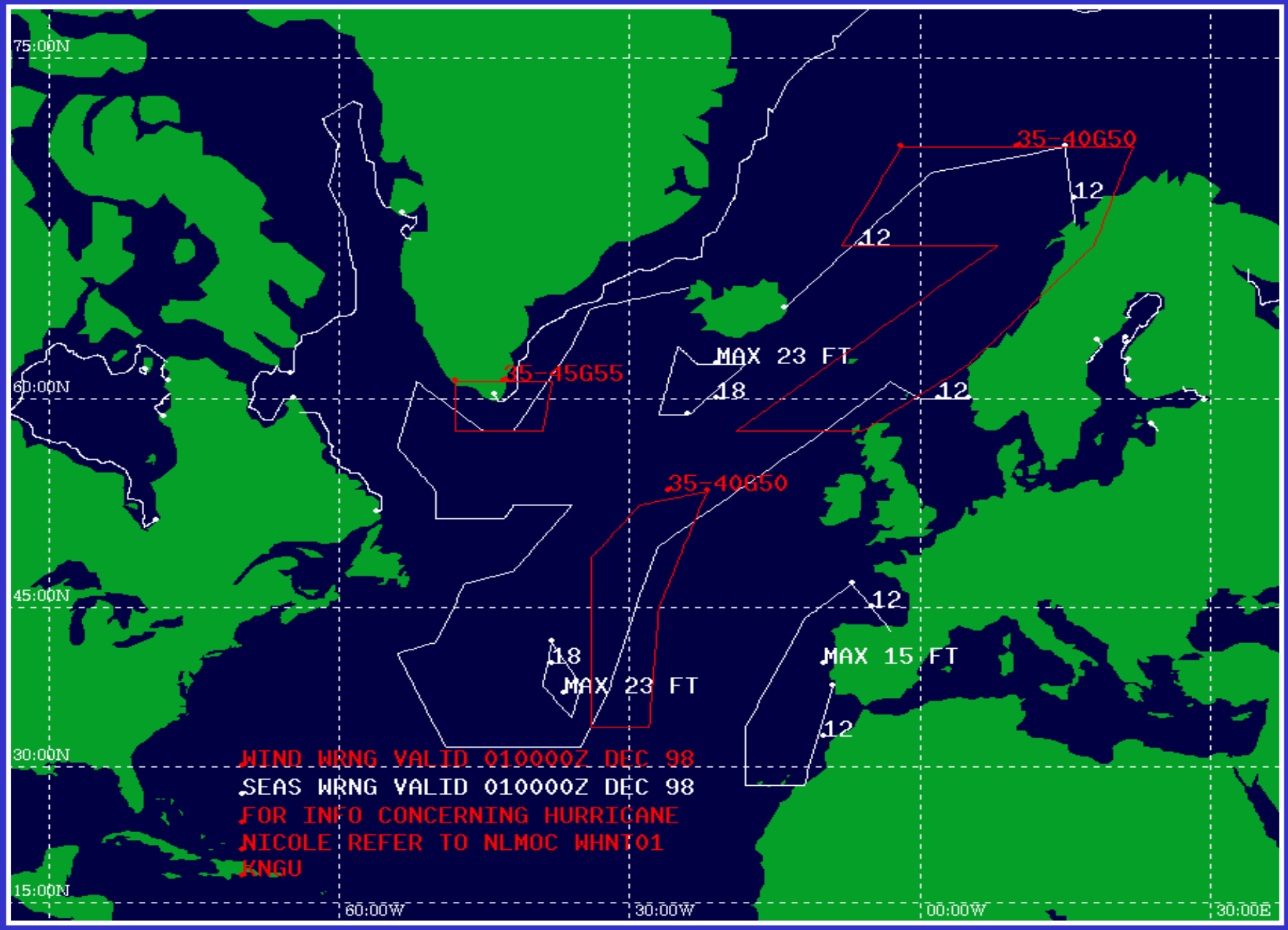
NAVAL ATLANTIC METEOROLOGY AND OCEANOGRAPHY CENTER, Norfolk, VA

Weather Warnings

- Local Warnings
  - Thunderstorm
  - Small Craft
  - Gale
  - Tidal Surge
- North Wall Advisory
- High Winds and Seas
- Tropical Cyclone Warnings


HURRICANE BONNIE (02L) WARNING #27
WHNT01 KNGU 260900
MSGDTG: NLMOC 260901Z AUG 98
260600Z POSIT: 31.8N 77.3W
MOVING 330 DEGREES TRUE AT 12 KNOTS
2606Z, WINDS 100KTS, GUSTS TO 120KTS
2618Z, WINDS 100KTS, GUSTS TO 120KTS
2706Z, WINDS 085KTS, GUSTS TO 105KTS
2718Z, WINDS 080KTS, GUSTS TO 095KTS
2806Z, WINDS 070KTS, GUSTS TO 085KTS
2906Z, WINDS 055KTS, GUSTS TO 065KTS
2906Z
2806Z
2718Z
2706Z
2618Z
2606Z
Hurricane Seas
01Jun – 30No
50N
45N
40N
35N
30N
25N
20N
15N
95W
90W
85W
80W
75W
70W
65W
60W
55W
50W
45W
40W
35W


LEGARE
BURKE_0
KAUFFMAN
PREVAIL
LOYAL
WASHINGTON
THORN
TRENTON
WASP
OAK HILL
GONZALEZ
NICHOLAS
GOLD ROVER
MARLBOROUG
GROVES SW
NORTHUMBER
40:00N
35:00N
30:00N
25:00N
80:00W
75:00W
70:00W
65:00W
60:00W
55:00W
50:00W
.1600Z MAX 60
.1500Z MAX 60
.1400Z MAX 60
.TROP STORM NLMOC
.13 JUN 0000Z
.MAX 45 KT
.010 AT 06 KT
.35 KT RADII SHOWN


75:00N
60:00N
45:00N
30:00N
15:00N
60:00W
30:00W
00:00W
30:00E
35-40G50
12
12
MAX 23 FT
35-45G55
18
12
35-40G50
12
18
MAX 23 FT
MAX 15 FT
12
WIND WRNG VALID 010000Z DEC 98
SEAS WRNG VALID 010000Z DEC 98
FOR INFO CONCERNING HURRICANE
NICOLE REFER TO NLMOC WHNT01
KNGU

OTSR- WEAX

"Don't Leave Home Without It!"

Ref: NAVMETOCCOMINST 3140.1

OTSR
OPTIMUM TRACK SHIP ROUTING

- *Advisory service whose primary mission is safety through route surveillance and recommendations for damage avoidance.*
- *If forecast weather or sea conditions are expected to exceed your maximum tolerance, an advisory or divert recommendation will be sent to you.*

- *Diverts are based on your limits set by the ship's CO. If none have been provided class defaults are used.*
- *OTSR DOES NOT SEND MESSAGES DAILY WHEN CONDITIONS ARE LESS THAN LIMITS.*
- *As with WEAX, valid MOVREP and accurate observations are critical to the quality of service.*

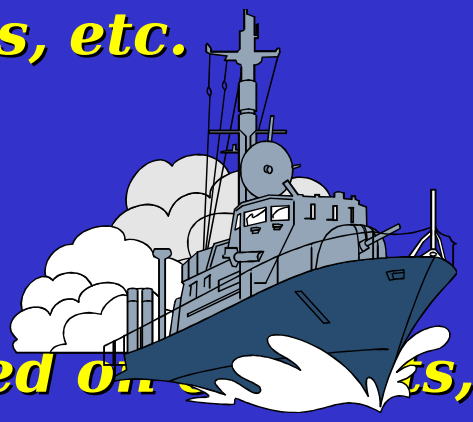
WEAX
ENROUTE WEATHER FORECASTS

- WEAX provides tailored weather forecasts along your MOVREP track.
- WEAX message sent at least once every 24 hours.

  Twice daily for Dive-ops, Salvops, Tow, Spec-Ops
- Aviation parameters are provided if Aviation WEAX (AVWX) requested.
- Quality WEAX service requires a valid MOVREP and accurate weather observations.

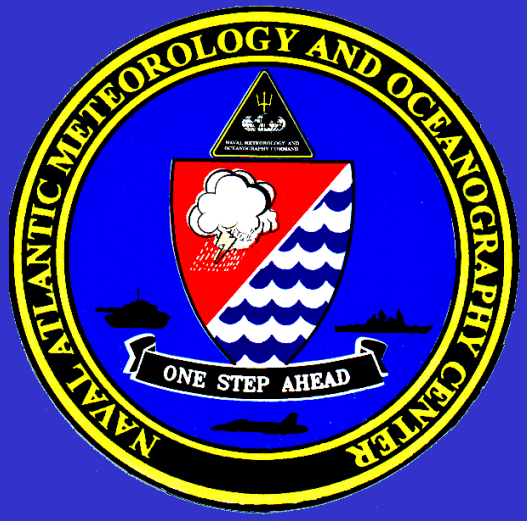
Additional Service

- Pre-deployment Briefs/Climatology Packages
  - Prevailing winds, average wave heights/periods, air temps, historical storm tracks, etc.
  - SAR Support
  - Recommended search areas based o... ...s, sea state, survival times, SST, etc.



SUMMARY

- **Broad range of support in ALL mission areas**
- **FLEXIBLE and CREATIVE application of TECHNOLOGY**
- **World-class WEB operations**
- **Great People**
- **Big Return on Investment**



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Questions ?

THE END